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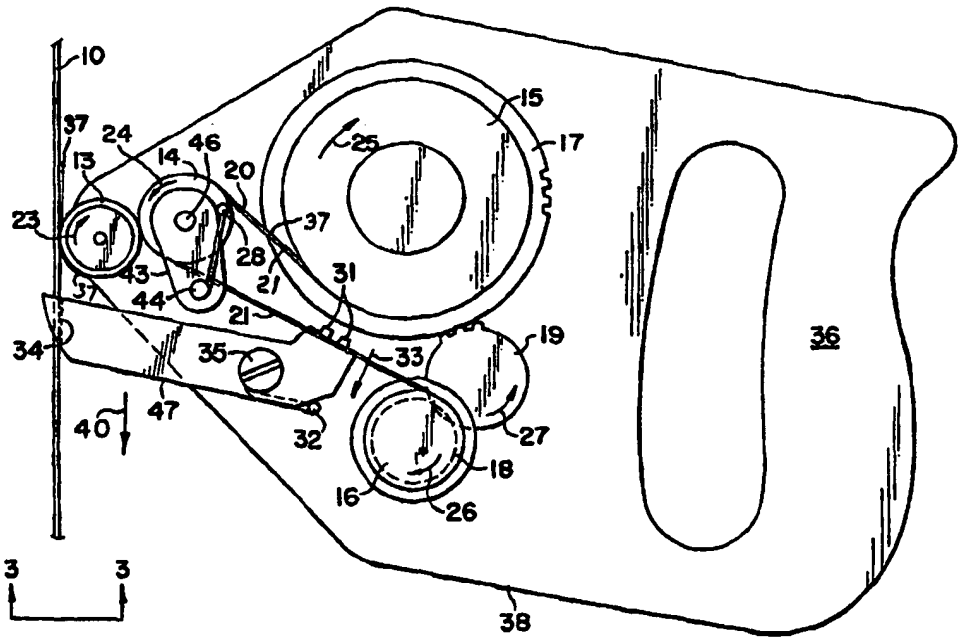
(54) Title: ADHESIVE APPLICATOR



(57) Abstract

A device for applying a strip (37) of double-sided adhesive to a surface (10), from a supply roll of composite tape (20) having a release liner (21) to which the double-sided adhesive strip (37) is attached, a press roller (14) to press the adhesive strip onto a transfer roller (13) having a poor affinity for adhesive strip (37) but a greater affinity than the release liner (21) to remove the adhesive strip (37) from the release liner (21) and apply the strip (37) to the surface (10), a roller (16) to wind up the release tape (21) and a selectively releasable stop (17, 31, 30, 41 or 17, 31, 32, 47 or 17, 31, 32, 47' or 51, 52, 32, 47") for permitting or preventing movement of the composite tape.

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ADHESIVE APPLICATOR

BACKGROUND OF THE INVENTION

It is general practice in the paper industry to produce a continuous sheet or web of paper which is wound onto large spools. In order to have a continuous operation it is, of course, necessary to have a system for instantaneously switching from winding the web of paper onto a full roll to an empty roll, particularly at modern speeds of paper production. In U.S. Patent No. 2,461,246 there is shown a method of feeding a tape onto the rotating empty roll core and causing it to be spirally wrapped on that core as it stretches tight across the traveling web of paper and cuts the paper, with the cut edge being led onto the empty roll supported by the cutting tape. Subsequent improvements such as shown in my three U.S. Patent Nos. 4,659,029; 4,757,950; and 4,783,018 illustrate how a cutting tape can be passed through a guideway underneath a traveling web of paper, perhaps 10 to 20 feet or more wide and be attached to the far side of an empty spool while the operator remains on the near side of the spool. These patents teach the use of mechanical arms to receive a cut end of the tape with adhesive on the tape, and to push the cut end into contact with the empty spool which winds the tape helically around the spool, cutting the paper web as it does, and wrapping the oncoming web around the empty spool. Processing difficulties have arisen to indicate the need for handling errors, such as the failure to apply a suitable amount of adhesive to the tape, which, in turn, means that the tape does not attach itself properly to the empty spool and, therefore, does not cut the traveling web of paper and transfer it to the empty spool. In the modern high speed plants it is very important that any such errors be handled quickly and efficiently. One improvement has been to use double-sided pressure-sensitive adhesive tape as the adhesive strip on the cutting tape. This is disclosed generally in my U.S. Patent Nos. 4,783,018 and 5,046,675. The present invention provides an improved apparatus for performing this task with double-sided pressure-sensitive adhesive tape. A second application of the present invention is to provide a hand held device to apply a strip of double-sided pressure-sensitive adhesive tape to a cutting tape where, for any reason, the feeding machinery failed to apply the necessary strip of adhesive to the leading portion of the tape.

It is an object of this invention to provide an improved apparatus for applying a short strip of double-sided pressure-sensitive adhesive tape to the forward portion of a length of cutting tape for use in transferring a traveling web of paper from one windup roll to another. It is another object of this invention to provide a hand held device for applying a strip of double-sided pressure-sensitive adhesive tape to a cutting tape, or to any other surface. Still other objects will become apparent from the more detailed descriptoin which follows.

BRIEF SUMMARY OF THE INVENTION

This invention relates to a device for applying a strip of double-sided pressure-sensitive adhesive tape to a surface including a supporting frame, a rotatable supply roll of composite tape consisting of a layer of double-sided adhesive tape adhered to a strippable release liner, a rotatable rubbery pressure roller positioned to receive the composite tape from the supply roll and press the side with the double-sided adhesive tape against a rotatable transfer roller that has a poor affinity for the adhesive tape but greater affinity than the release liner, a rotatable windup roller to receive the backing tape, a means for coordinating the rotation of the supply roll with the rotation of the windup roller, and a stop means for selectively permitting or preventing the rotation of the supply roll or of the transfer roll.

In a specific embodiment of this invention the device is a part of an integrated machine for handling the cutting tape from a supply roll to its use in cutting and transferring a traveling web of paper. In another embodiment the device of this invention is a hand held apparatus for applying a strip of adhesive to a surface.

BRIEF DESCRIPTION OF THE DRAWINGS

The novel features believed to be characteristic of this invention are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and method of operation, together with further objects and advantages thereof, may best be understood by reference to the following description taken in connection with the accompanying drawings in which:

FIG. 1 shows a side elevational view of a portion of an integrated machine for handling cutting tape and for applying a strip of adhesive by the device of this invention;

FIG. 2 shows a top plan view of a first embodiment of a hand held adhesive applicator according to this invention;

FIG. 3 is a partial side elevational view taken at 3--3 of FIG. 2;

FIG. 4 is a top plan view of a second embodiment of a hand held adhesive applicator according to this invention;

FIG. 5 is a partial top plan view of a third embodiment of a hand held adhesive applicator according to this invention showing the transfer roller in locked condition; and

FIG. 6 is a view similar to FIG. 5 and showing the transfer roller in unlocked condition.

DETAILED DESCRIPTION OF THE INVENTION

The features of this invention are best illustrated and understood by reference to the attached drawings.

In FIG. 1 there is shown how this invention can be incorporated into an integrated cutting tape handling apparatus, such as disclosed in my U.S. Patent No. 5,046,675. In FIG. 2 of such patent there is a schematic elevational view of an apparatus for conducting a length of cutting tape through a guide, cutting it to the paper length, applying a strip of adhesive to a forward portion of the tape, delivering it to a feeder, and then, at a selected time, projecting it outward to an empty windup roller to begin winding a web of paper as the tape cuts through a traveling web. FIG. 1 of this application shows how the device of this invention is incorporated into that integrated machine.

Cutting tape 10 moves in the direction of arrow 22 through guide channel 11. When it is appropriate to place a strip 37 of adhesive on the bottom of cutting tape 10, supply wheel 15 turns in the direction of arrow 25 to feed a composite tape 20 to small press roller 14. Composite tape 20 is a layer of double-sided pressure-sensitive adhesive 37 stuck onto a layer of release liner 21 which readily pulls away from the adhesive 37 when the adhesive contacts a surface to which it has some affinity. In this instance the composite tape 20 passes around press roller 14 with the double-sided pressure-sensitive adhesive strip 37 sticking to the transfer roller 13 turning in the direction of arrow 23 and the release liner 21 is directed to windup roller 16 turning in the direction of arrow 26. Transfer roller 13 turns in the same direction as movement of

tape 10 as the two approach each other at a tangent. At the same time large pressure roller 12 presses downwardly against the upper surface of tape 10 as roller 12 turns in the direction of arrow 39. Under the pressure of roller 12 and roller 13 the double-sided pressure-sensitive adhesive strip 37 attaches itself to the underside of tape 10 because its affinity to the twisted paper fiber in tape 10 is considerably greater than its affinity for silicone rubber covering transfer roller 13. It will be appreciated that transfer roller 13 should be somewhat elastic so as to provide an even pressure pushing against composite tape 20 on small pressure roller 14 on the one side and against tape 10 on the other side. Preferably, small pressure roller 14 is rubbery or resilient and is biased against transfer roller 13 by means of spring 45 acting on lever 43 pivoted at pin 44 and connected to shaft 46 of small pressure roller 14. The material of transfer roller 13 must also be slightly tacky to the strip of pressure-sensitive adhesive 37 so as to pull it away from release tape 21 but not so tacky that it will not easily release the adhesive strip 37 to cutting tape 10. Silicone rubber is a preferred material, but there are other rubbery materials that are also operable, e.g., neoprene, nylon, butadiene rubber, polyolefin elastomers, etc.

In order to drive the device of this invention there is shown a gear train with gears on wheel 17 of supply roller 15, wheel 18 of windup roller 16, and an idler gear 19 engaged with both of gear wheels 17 and 18. It will be appreciated that idler gear 19 is employed in order to make rollers 15 and 16 turn in the direction of arrows 25 and 26 to remove tape 20 from roller 15 and to wind up liner 21 on roller 16. Idler gear 19 can be eliminated by rewinding liner 21 in the opposite direction on roller 16. A motor or other driving force may be attached to any of roller 15, roller 16, or gear 19 to provide power for the entire device. Friction between tape 20 and roller 14, and between rollers 14 and 13 causes these components to turn.

Timing devices well known in the art can be employed to start and stop the driving of this device when a desired length of adhesive strip 37 has been applied. In the embodiment of FIG. 1 pressure roller 12 lifts slightly away from roller 13 after a selected length of tape 10 has passed, and, at the same time, positive stop arm 30, which is powered by a pneumatic cylinder 41, pushes teeth 31 into the teeth on gear wheel

17 causing roller 15 to stop turning while tape 10 continues to move with the strip 37 attached thereto. When roller 15 stops, rollers 13 and 14 also stop thereby rupturing the strip 37 of adhesive at 12 o'clock on transfer roller 13. When it is time to begin applying a new adhesive strip 37, cylinder 41 is activated to cause arm 30 to be withdrawn, and at the same time pressure roller 12 moves downward onto tape 10, applying the adhesive strip 37 to tape 10. There is also shown button 42 which is pushed to cause cylinder 41 to pull arm 30 away from gear wheel 17 when it is necessary to insert a new roll of composite tape 20 on roller 15 and to thread the tape around rollers 13, 14 and 16.

In FIGS. 2-3 there is shown a device to be held in an operator's hand to be used to apply a strip 37 of adhesive to a surface, e.g., a paper cutting tape 10. The same components as those described above with respect to FIG. 1 are employed in FIG. 2 with substantially the same function and substantially the same operations. Supply roller 15 rotates in the direction of arrow 25 to deliver composite tape 20 to press roller 14, which in turn, transfers the adhesive strip 37 from composite tape 20 to transfer roller 13 and returns the release liner 21 from composite tape 20 to windup roller 16. Gear wheels 17 (on roller 15) and 18 (on roller 16) are engaged with idler gear wheel 19 to provide the appropriate movement to these components in the directions of arrows 25, 26, and 27, respectively. These components are all mounted on an appropriate frame 38 which may be as simple as a plate of aluminum with a suitable handle 36 in the nature of a saw grip or a pistol grip. The device is operated by pressing frame 38 and roller 13 toward the surface to which the adhesive strip is to be applied. In this illustration the surface is cutting tape 10, and so roller 13 is pressed against tape 10 and moved in the direction of arrow 40 while maintaining roller 13 pressed against tape 10. This causes roller 13 to turn in the direction of arrow 23. Friction causes press roller 14 to move in the direction of arrow 24 and also causes composite tape 20 to be unwound from supply roller 15 causing it to turn in the direction of roller 25. There also is a lever means 43 which is mounted on shaft 46 of roller 14 and is biased by spring 28 around pivot pin 44 to apply pressure against transfer roller 13. Gear wheels 17, 18 and 19 cause windup roller 16 to turn in the direction of arrow 26. If gear teeth on wheels 17, 18 and 19 are identical the linear movement of tape 20 will be exactly the same as the linear movement of liner 21, thus, synchronizing the unwinding of

composite tape with the windup of release tape.

In this embodiment, there is an added feature of a stop/guide arm 47 which has one or more gear tooth projections 31' at the near end of arm 47 adjacent gear wheel 17, and has a guiding ledge 34 adjacent the other distal end of arm 47. Arm 47 is pivoted in its central portion at pin 35 and is fitted with a spring 32 to bias gear teeth 31 toward gear wheel 17. Gear teeth 31 are shaped so as to mesh with the teeth in gear wheel 17, or, alternatively, the projection 31 is shaped so as to wedge itself into the gears of wheel 17 and prevent it from turning. As may be appreciated, when projections 31 are moved to make contact with gear wheel 17, roller 15 cannot turn, and this effectively stops the turning of rollers 13 and 14, idler gear 19, and roller 18. This prevents the unwinding of supply roll 15 until the operator wants to apply a strip of adhesive to a surface such as tape 10. When that time occurs the device is placed so that guiding ledge 34 is positioned along the edge of tape 10 (see FIG. 3) or along the edge of any other surface to which a strip of adhesive is to be applied, and pressure is applied pushing roller 13 against the tape 10. This causes arm 47 to pivot, moving teeth 31 away from wheel 17 in the direction of arrow 33 and freeing supply roller 15 and all other rollers and gear wheels to turn. When the adhesive strip 37 has been applied, the operator lifts roller 13 away from tape 10 or the substitute surface, causing arm 47 to pivot back to the position where teeth 31 engage gear wheel 17 and stop the movement of rollers 13-16 and gear 19. The fragility of the adhesive strip 37 is such that the strip ruptures near the contact line between tape 10 and transfer roller 13. No positive cutting action is necessary if the adhesive strip is sufficiently thin, i.e., on the order of 0.001 to 0.005 inch.

It is also to be noted that the hand-held embodiment of FIG. 2 can be used to apply double-sided adhesive tape to any surface by merely adding a knife or scissors to cut the double-sided tape when the desired length has been applied. In this instance, of course, there is no need for roller 16 to wind up liner 21.

In the embodiment of FIG. 4, like characters from the previous embodiments represent substantially the same components. The locking arm 47' is configured to pivot about axis 15' of roller 14 and carries at its end opposite locking teeth 31 the transfer roll 13. In such embodiment there is sufficient resiliency and elasticity between press

roller 14 and transfer roller 13 so that press roller 14 need not be spring biased against roller 13 as shown and described in connection with FIGS. 1 and 2. Accordingly, when transfer roller 13 is pressed against cutting tape or surface 10, arm 47' pivots to cause teeth 31 to be disengaged from the teeth on gear wheel 17 and permit the transfer of adhesive strip 37 onto surface 10. If found to be necessary, the press roller 14 could be mounted through slots in each of arm 47 and frame 38 and spring loaded towards transfer roller 13 or any other appropriate way.

The embodiment of FIGS. 5 and 6 provides an alternate way of locking the transfer roller 13' rather than arm 47" locking the supply of tape 15 on gear wheel 17. The arm 47" includes an aperture or window 50 with several teeth 51 projecting inwardly which mate with gear wheel 52 that rotates with transfer roller 13. The spring 32 biases arm 47" outwardly such that teeth 51 mesh with gear wheel 52 to lock same against rotation, as shown in FIG. 5. When the transfer roll 13 is pressed against the cutting tape or surface 10, gear teeth 51 disengage gear wheel 52 permitting free rotation of transfer roller 13 as it applies adhesive strip 37 to surface 10 as depicted in FIG. 6. After a sufficient strip 37 is applied, the operator withdraws the lateral force applied to the device until teeth 51 lock onto gear wheel 52 and the operator applies a subsequent force generally downwardly with roller 13 disengaged from surface 10 to cause the tearing or rupture of such strip 37 by stretching same.

While the invention has been described with respect to certain specific embodiments, it will be appreciated that many modifications and changes may be made by those skilled in the art without departing from the spirit of the invention. It is intended, therefore, by the appended claims to cover all such modifications and changes as fall within the true spirit and scope of the invention.

1. A device for applying a layer of double-sided pressure-sensitive adhesive tape to a surface including a supporting frams, a rotatable supply roller adapted to receive a removable roll of composite tape having a layer of dcuble-sided adhesive tape adhered to a strippable backing liner, a rotatable pressure roller positioned to receive the composite tape from the supply roll, a rotatable windup roller to receive the backing liner from said pressure roller, means for coordinating the rotation of said supply roller with the rotation of said windup roller, selectively releasable stop means for selectively permitting or preventing movement of the tape, the improvement comprising a rotatable transfer roller having a surface with a poor affinity for the adhesive tape, said pressure roller and transfer roller sandwiching therebetween the tape with the backing liner being in contact with said pressure roller and the adhesive tape being in contact with said transfer roller, said transfer roller having a greater affinity for the adhesive tape than between the adhesive tape and the backing liner.

2. The device of Claim 1 wherein said frame includes a handle permitting an operator of the device to press said transfer roller against a surface while moving said device in a predetermined direction which rotates said transfer roller generally in a direction opposite to said predetermined direction and along a surface to apply the strip of said double-sided pressure-sensitive adhesive thereto.

3. The device of Claim 1 or 2 wherein said surface of said transfer roller is silicone rubber.

4. The device of Claim 1, 2 or 3 wherein said stop means includes a gear wheel affixed to said supply roller, a pivotable spring-biased arm attached to said frame, and a gear tooth on said arm which when pivoted will engage said tooth with gears on said wheel and thereby prevent it from rotating.

5. The device of Claim 5 wherein said pivotable arm is spring biased to urge said tooth into engagement with said gear wheel.

6. The device of Claim 6 wherein said tooth is at one end of said arm, a guiding ledge located at another end of said arm for guiding said transfer roller to apply the strip of pressure-sensitive tape parallel to an edge of a surface.

7. The device of Claim 1, 2 or 3 wherein said stop means includes a pivotable spring biased arm attached to said frame, a rotatable gear wheel affixed to one said roller, and a gear tooth carried by said arm for engagement with said gear wheel to prevent said device from applying the adhesive tape to a surface.

8. The device of Claim 7 wherein said arm carries said transfer roller adjacent one of its ends, said transfer roller being pressed against a surface to cause said gear tooth to release from said gear wheel.

9. The device of Claim 8 wherein said gear tooth is located on another end of said arm, said gear wheel being affixed to said supply roller.

10. The device of Claim 1, 2 or 3 wherein said stop means includes a pivotable spring biased arm attached to said frame, a rotatable gear wheel affixed to said transfer roller, and a gear tooth carried by said arm for engagement with said gear wheel to prevent said device from applying the adhesive tape to a surface, said transfer roller being pressed against a surface to cause said gear tooth to release from said gear wheel.

11. A device for applying a layer of double-sided pressure-sensitive adhesive tape to a surface including a supporting frame, supply spool means connected to said frame for supporting a removable supply roll of composite tape consisting of a layer of double-sided adhesive tape adhered to a strippable backing liner, a rotatable pressure roller attached to said frame and positioned to receive a compcsite tape from the supply roll with the liner engaging said pressure roller, a rotatable windup spool means attached to said frame to receive the backing liner, means for coordinating the rotation of said supply spool means with the rotation of said windup spool means and stop means for selectively permitting or preventing movement of the tape, the improvement comprising a rotatable transfer roller having a poor affinity for adhesive tape, said pressure roller being adapted to press a side with a layer of double-sided adhesive tape against said transfer roller.

12. The device of Claim 11 wherein said frame includes a handle for grasping by an operator for pressing said transfer roller against a surface while rolling said transfer roller along a surface to apply a strip of a layer of double-sided pressure-sensitive adhesive thereto.

13. The device of Claim 11 or 12 wherein said transfer roller has a silicone rubber surface.

14. The device of Claim 11, 12 or 13 wherein said stop means includes a gear wheel affixed to said supply spool means, a pivotal arm attached to said frame, and at least one gear tooth on said arm which when pivoted toward said wheel will cause said at least one tooth to engage with gears on said wheel and thereby prevent it from rotating.

15. The device of Claim 14 further comprising spring biasing means engaged with said pivotal arm to urge said tooth into engagement with said gear wheel.

16. The device of Claim 11, 12 or 13 further comprising a pivotal arm mounted to said frame, said arm movably mounting said pressure roller with respect to said frame, and spring biasing means engaged between said arm and said frame to press said pressure roller against said transfer roller with a composite tape sandwiched therebetween.

17. The device of Claim 11 further comprising a press roll for pressing a paper cutting tape which is adapted to cut a traveling web of paper against said transfer roller as a paper cutting tape moves therebetween whereby a layer of double-sided pressure-sensitive tape is transferred onto a paper cutting tape.

18. The device of Claim 11, 12 or 13 wherein said stop means includes a pivotable spring biased arm attached to said frame, a rotatable gear wheel affixed to one said roller, and a gear tooth carried by said arm for engagement with said gear wheel to prevent said device from applying the adhesive tape to a surface.

19. The device of Claim 18 wherein said arm carries said transfer roller adjacent one of its ends, said transfer roller being pressed against a surface to cause said gear tooth to release from said gear wheel, said gear tooth being located on another end of said arm, said gear wheel being affixed to said supply roller.

20. The device of Claim 11, 12 or 13 wherein said stop means includes a pivotable spring biased arm attached to said frame, a rotatable gear wheel affixed to said transfer roller, and a gear tooth carried by said arm for engagement with said gear wheel to prevent said device from applying the adhesive tape to a surface, said transfer roller being pressed against a surface to cause said gear tooth to release from said gear wheel.

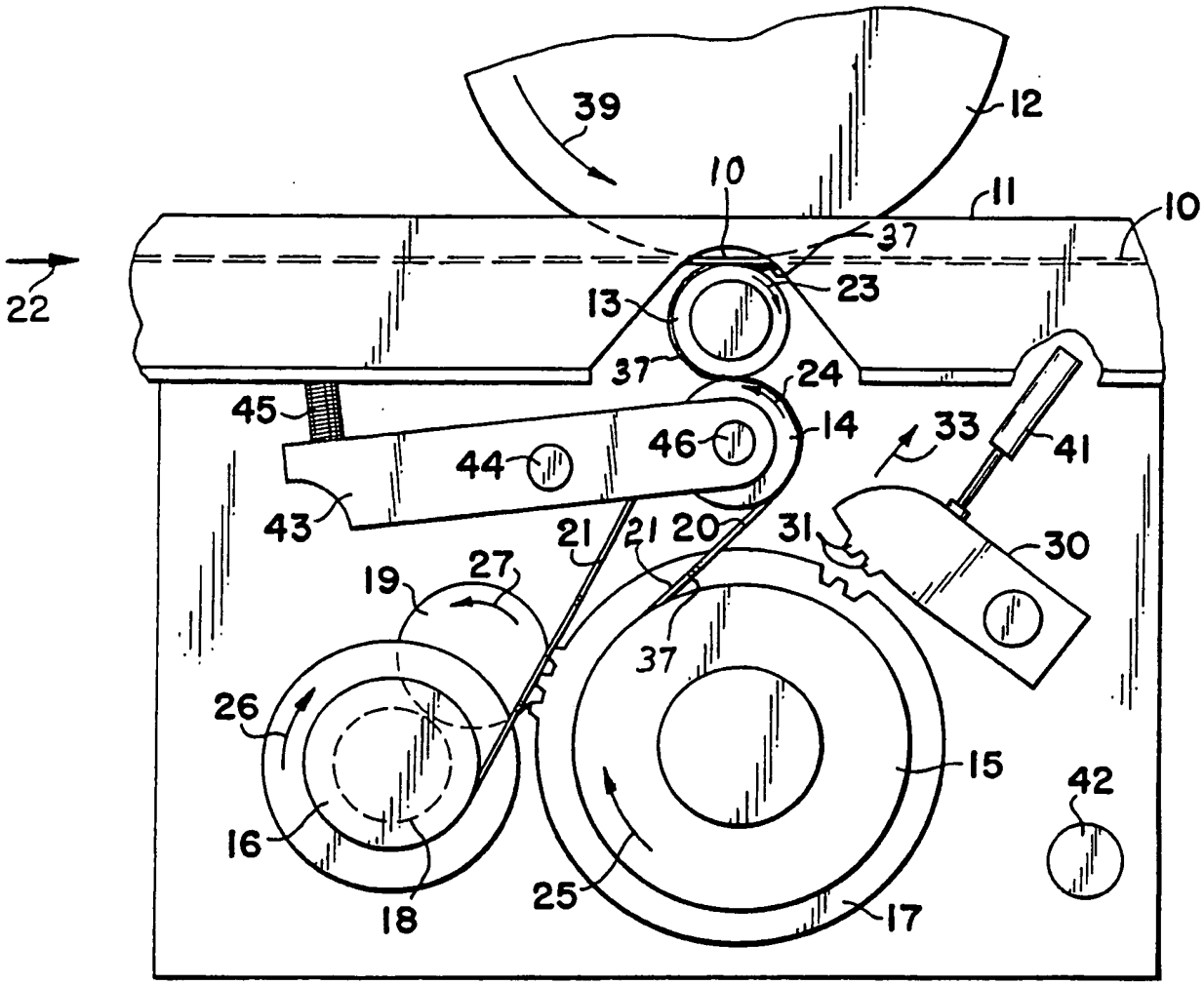
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FIG 1

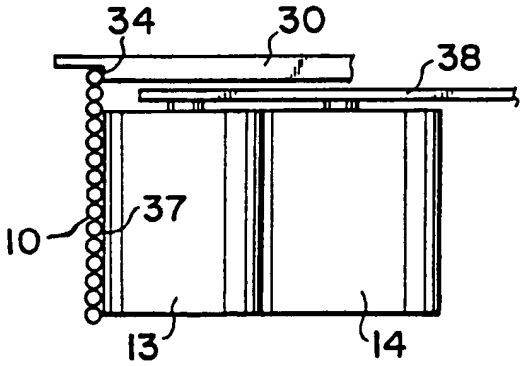
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FIG 3

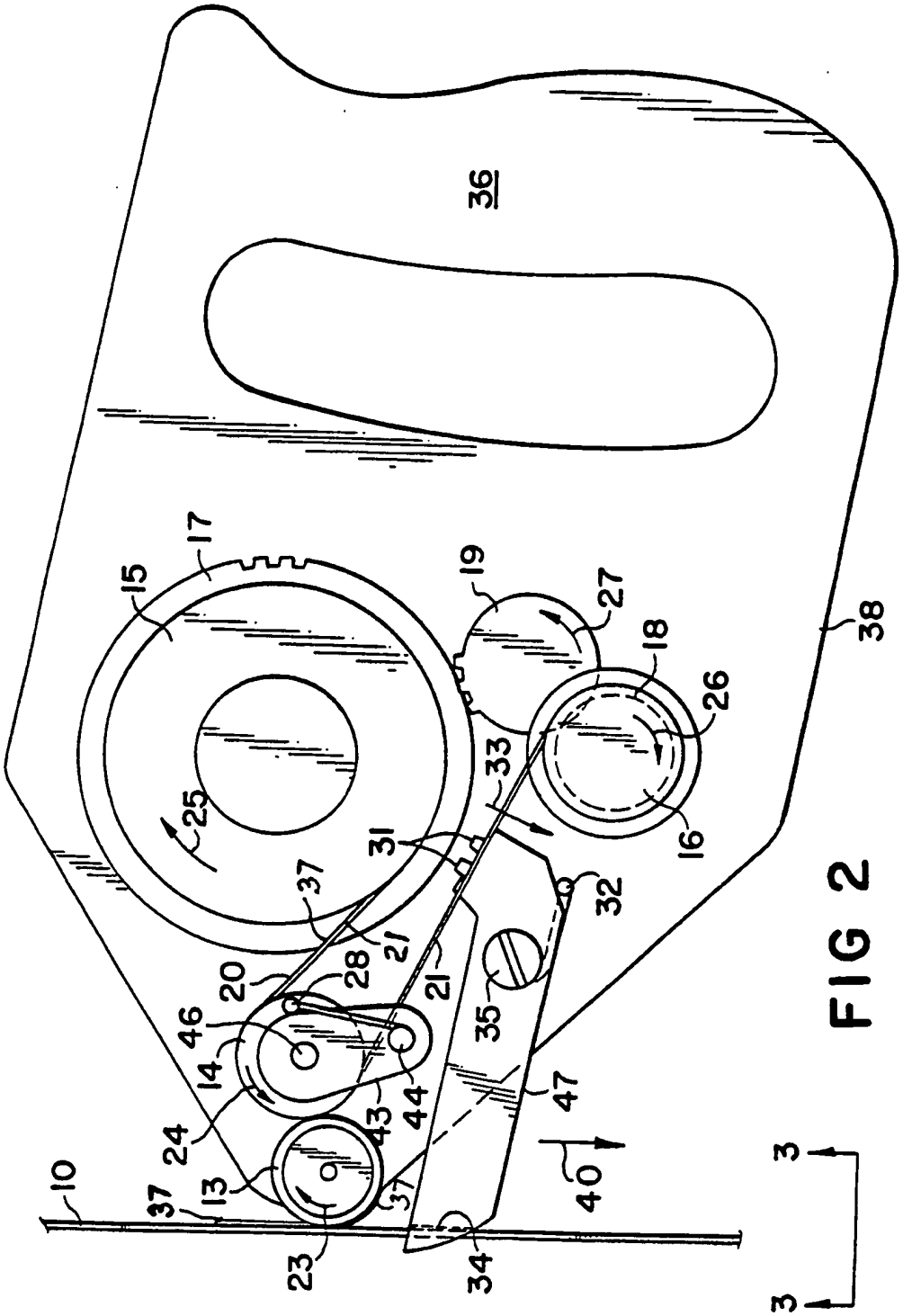
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FIG 2

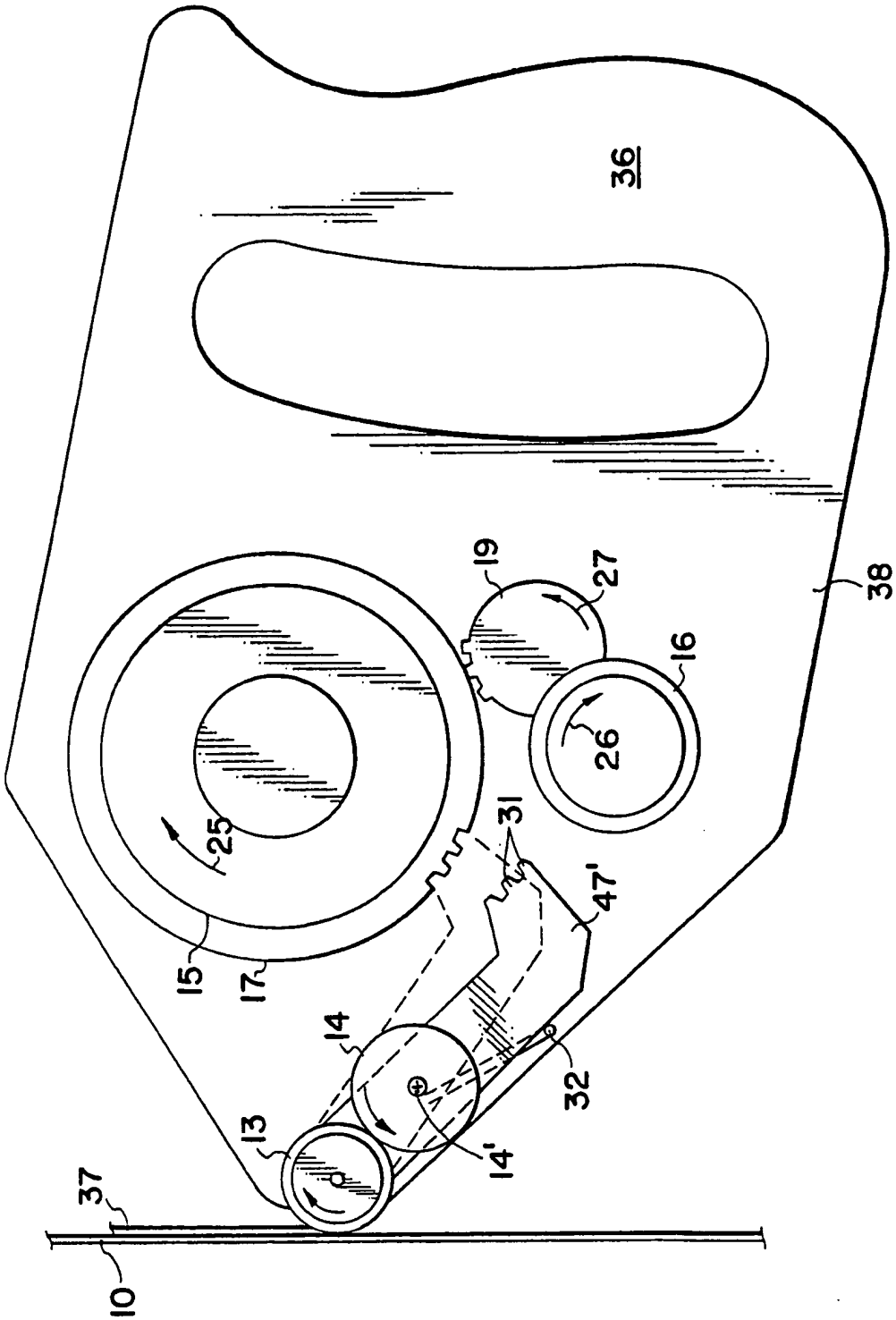

FIG 4

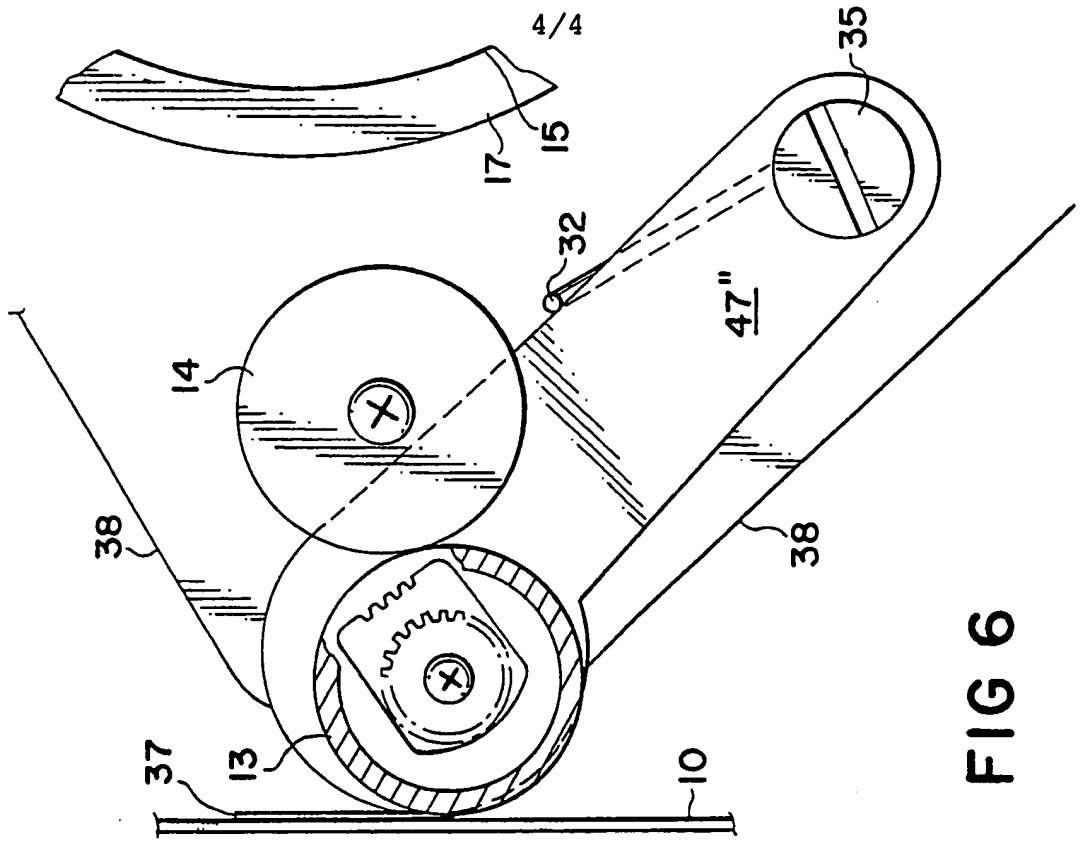

FIG 6

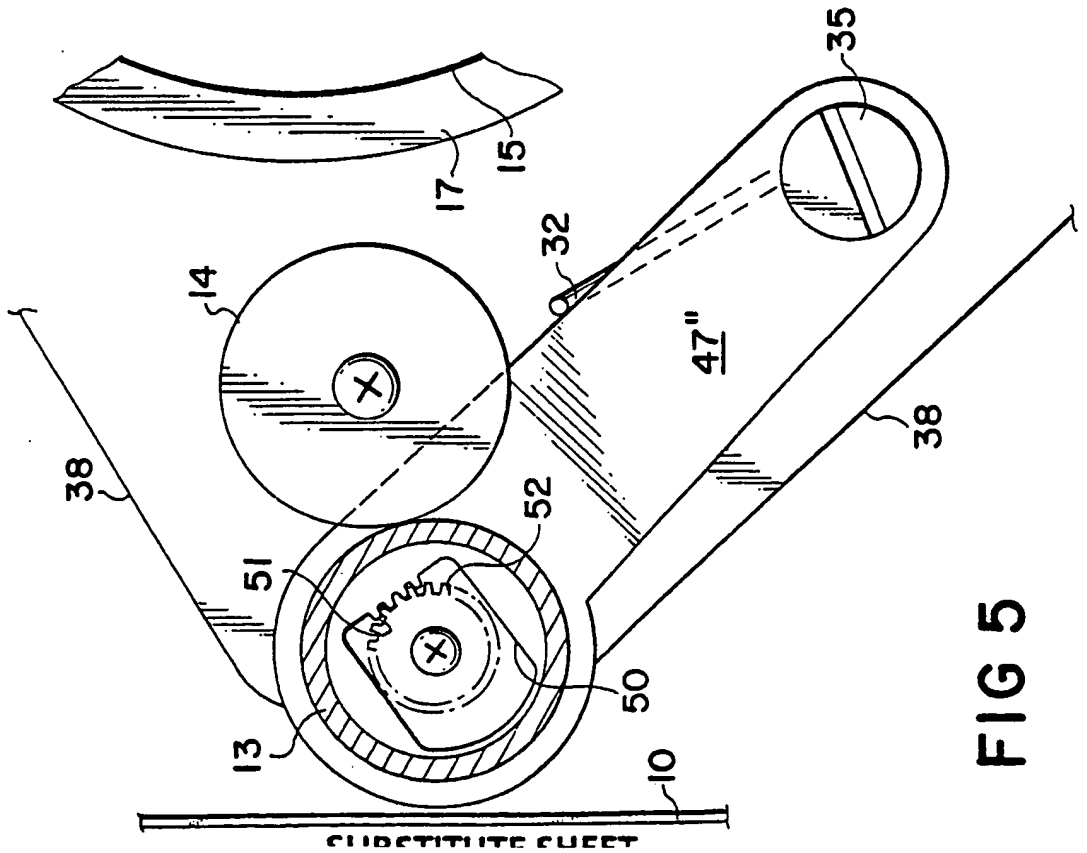

FIG 5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US93/00573

A. CLASSIFICATION OF SUBJECT MATTER

IPC(5) :B32B 31/00
US CL :156/523,574,577,579,584
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 156/519,521,522; 242/56R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

none

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US,A, 3,969,181 (Seabold) 13 July 1976 See col. 2, lines 39-68 and col. 3, lines 1-41.	1,11
A	US,A, 4,582,558 (Antonson) 15 April 1986 See col. 3, lines 1-13.	1,11

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be part of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search 13 APRIL 1993	Date of mailing of the international search report 29 APR 1993
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. NOT APPLICABLE	Authorized officer J. SELLS Telephone No. (703) 308-2090

Form PCT/ISA/210 (second sheet)(July 1992)*

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US93/00573

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☒ Claims Nos.: 5,6
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

PCT Article 17(2)(a)(ii);
Claim 5 depends from claim 5.
Claim 6 depends from claim 6.

3. ☒ Claims Nos.: 4,7,8,9,10,14,15,16,18,19,20
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.